COST *and* MANAGEMENT

THE OFFICIAL JOURNAL OF THE

CANADIAN SOCIETY OF COST ACCOUNTANTS

INCORPORATED 1920

HEADQUARTERS, 81 VICTORIA STREET, TORONTO

Telephone Elgin 8914

Vol. 5 JUNE, 1930 No. 6

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Subscription price to non-members, $5 a year. Single copies 50 cents. Members desiring 5 copies or more of a single issue may obtain them at 25 cents each.

Tie-in of Factory Records with the Costing System

By C. OLIVER WELLINGTON,
Partner, Scovell Wellington & Company

(Before Montreal Chapter, October 17, 1929.)

I AM very glad indeed to be in Montreal again. I have had the pleasure of talking to your Society before and appreciated the opportunity to come up and renew old acquaintances during the day and this evening.

I am particularly pleased to discuss this question of the tie-in of the factory records with the costing system, because we have run across so many cases where the cost and production records were entirely separate and distinct from the general accounting and from each other.

FEATURE TOPIC FOR YEAR'S MEETINGS

THIS issue of Cost and Management is taken up almost entirely with papers on "The Tie-in of Factory Records," the topic adopted for discussion in all our Chapters at one or two meetings of the past season.

Montreal, Toronto, Hamilton and Winnipeg Chapters all had meetings on this subject. Some interesting discussions are unfortunately not available for printing, but what we have should present useful points for our members as a whole.

Your executive has one or two topics under consideration, to be handled in a similar way in the coming season, and announcement of them will be made in good time to be included in the Chapter programs.

Our experience shows that the most effective way to handle records of cost and production is to have them merely a part of a complete whole, that is, all tied together so that you may be sure that one set of records is co-ordinated with the other, and that the figures you obtained can be proved with the financial books.

Too many business men are looking for a quick cure through a patented medicine. It may be some labor incentive scheme. It may be psychological testing of applicants for jobs. It may be some other panacea that is popular at the moment. Even if the patented medicine has some effect, it is a stimulant and not a cure. Apparent improvement is merely temporary, because fundamental defects have not been cured.

TIE-IN OF FACTORY RECORDS WITH THE COSTING SYSTEM

Importance of Working Conditions

There has been great emphasis placed on increasing the production by speeding up the workmen and no emphasis on removing the conditions which prevented those same workmen from increasing production without greater effort. I am not opposed to time study work as such, but I am pointing out that business executives should realize that it is merely part of a complete whole and not an end in itself.

Some concerns have had a very heavy labor turn-over, but, instead of finding out all the causes, so as many as possible may be removed, the executives have employed a man to give mental tests to the applicants for jobs. This might well be good in itself, but the greatest cause for employees quitting might be working conditions after they were hired—and those most likely to pass the mental test would be the first to quit.

This tendency to look for a quick cure rather than a slower permanent improvement reminds me of the story of a Kentucky mountaineer who made moonshine whiskey. Somebody asked him why he did not age his whiskey and he said, "I tried that once. I aged some for three days and it wasn't a bit better." If we expect good results in whiskey or anything else we must give sufficient time and care to the problems. We must, in handling costs and production, work out records and procedures so that they will run smoothly and fit one with another.

Standard Cost Plan

To be of the greatest help to-night I am going to make my remarks cover a situation in a plant operating under a standard cost plan. In that way I believe I can bring out most of the problems and indicate their relation one to another.

In dealing with any manufacturing business we have to consider the three main groups—material, labor and burden. It is often convenient in handling the records to combine two of these three groups, but whether they are handled in groups or separately the principles involved are the same.

Handling of Materials

Taking up first the handling of materials and starting with raw materials, we must have an adequate system of stores control. This means proper space for storage of the raw materials, proper bins, racks, etc., to store the maximum quantity in the minimum space, making it convenient for storing and withdrawing. It also should mean proper equipment for handling the raw materials economically from the receiving platform to the stores and out again to the manufacturing departments. Adequate stores control also requires proper stores records, usually bin cards with the physical stock on which will be recorded the quantities on hand, received and withdrawn. There will also be proper stores records in the planning and cost departments for keeping the same information, and, in addition giving information needed for planning and purchasing. This would include not only the quantity on hand but the quantity on order not yet received. It would also show the quantity apportioned to manufacturing orders but not yet actually drawn from stock. Unless we have, in addition to the actual quantity on hand, a knowledge of the quantities coming on

purchase orders and apportioned on manufacturing orders already issued or promised, we will not know the amount available for the next manufacturing order that comes in. A complete stores record is also very helpful in placing purchase orders at proper times to take care of manufacturing requirements and still not tie up too much capital in inventory.

Gain or Loss on Material Costs

In addition to the records above noted for quantities, it is usually well on the stores cards to have a column for dollar value, and usually at the head of the card a memorandum of the standard cost to be used for that particular raw material. The difference between the actual cost and the standard cost represents a material loss and gain. This is the first of the variations between standard and actual cost about which I will speak to-night.

In many kinds of business it is very important to separate the gain or loss on materials from gain or loss on the regular manufacturing and selling operations. When we have analyzed carefully for certain companies the results over a period of years, we have been surprised to find what a large proportion of the net profit has been made from increases in market prices of raw material and how little from manufacturing and selling goods. The executives of many companies are good speculators in materials but poor manufacturers. I do not belittle the importance of buying at the right time. That is, and should be, a very important function of one of the chief executives in a business where raw material prices are subject to fluctuation, but I would set up the accounts so as to separate gains or losses from changes in market prices of raw materials, from the gains and losses from regular manufacturing and selling operations. We have developed such plans for clients in many different industries and have yet to find a case where the information available from such separation has not been of great help to the executives.

There are two general plans for handling in the records and accounts the differences between standard cost and actual cost of raw material. The first, is to record the difference at the time the goods are purchased; and the second, is to record the difference at the time the materials are drawn from storage and put into process.

If the first plan is to be followed, it is most convenient to record the variance by the use of two columns on the invoice register, entering in one column the actual cost as shown by the invoice, and, in the other column, the standard cost of the same item. The standard cost is posted to the inventory records in detail and to the ledger accounts in total, and the difference between the standard cost and the actual cost becomes the gain or loss on materials purchased.

Under the second plan the materials are carried on the stores cards at actual cost and the standard cost is used only as the raw materials are withdrawn and put into process. The procedure here is to make two notations of prices on the material requisition, the actual cost and the standard cost, and to make two extensions in dollars and cents. The difference between the two amounts, summarized for the total materials drawn for a period, represents the gain or loss on standard prices of raw material.

A variation of the second plan is to use instead of a general standard the material cost at which the customer's order was figured when the order was taken. Such a modification is important in certain industries where the raw material fluctuates from day to day and, therefore, the requirements on customers' orders are to be covered by commitments for raw material in sufficient quantity and at the price used in figuring the customer's order. It may happen that the order will be finished and shipped at a time when the price of the same raw material is substantially higher or lower, but the original raw material price used in the estimate would be used in figuring the cost of goods sold. This modified plan is similar in principle but recognizes special conditions we have met in certain industries.

Advantage of Standard Cost of Material

One great advantage in figuring materials at standard cost, and picking up the variances between standard and actual, is to simplify the cost figuring and to eliminate from the work-in-process fluctuations in material costs. Once the standard prices are set they will not be changed unless there is a substantial change up or down in the level of prices. Minor fluctuations will be disregarded. However, the total difference between standard cost and actual cost will be accumulated, and this accumulated difference, by its size in comparison with raw materials used, will indicate the necessity for changing the standards. The standards for raw material are carried through work-in-process to finished goods and cost of goods sold, so that it is not necessary to figure individual lots separately, but the same standards hold good for all items involving the same material. When a standard is changed all items will be changed accordingly.

I have pointed out the necessity for adequate control of raw material through proper store records. Withdrawals from stores for material put into manufacturing process will be recorded on proper requisitions. In most instances, the bill of material showing the quantities of various materials necessary for a manufacturing order, can be used as a group requisition for the quantities needed. We may then be sure that the materials drawn and put into process will correspond with the materials included in the standard cost, which will be used later as the credit to work-in-process when the goods are finished.

Additional or Surplus Material

When material is spoiled in manufacturing departments and more material is needed to complete the order, a separate requisition should be made for this additional material and the proper charge made to an account with some such title as "Loss on Material in Process," which is another of the variances from standard cost.

If material drawn on requisition is not needed, it will be returned to stores and a credit requisition will be made. This credit will be to Work-in-Process if the total quantity to be made on the order has been reduced, or to the account "Loss on Material in Process" if it is due to less spoilage in the manufacturing operations than is called for in the standard. It is essential that standards be properly set to allow for reasonable spoilage of material in the manufacturing processes. Unless this is done, the final cost as figured will represent a

standard of impossible attainment, and the cost and variances from standard cost will be incorrect and misleading. The standard costs should be developed so that they may be obtained by good work under normal operating conditions.

I am reminded of a Scotch superintendent of a textile mill for which we were developing a cost system some years ago. The looms in the weave room were geared up to make so many picks per minute which, multiplied by 60, gave so many per hour. This was referred to as the "possible maximum," but the man who made the statement was corrected by the Scotchman, who said, "Nay, that's the eempossible maximum." He had in mind the breaking of threads, occasional small repairs, and similar items which, under the best possible management, would prevent the theoretical number of picks turning out the corresponding yards of cloth.

In the illustration I have just given of less spoilage than the standard, with most concerns all of the material started on the order would be put through the various manufacturing operations and finished, and the final credit to Gain on Material in Process would be made from the final excess of pieces made above the standard called for from the raw material drawn on the order.

Under the standard cost plan, by using standard quantities and standard prices we can be sure that material going in and coming out of process is handled on the same basis. It is merely necessary to check up the variances from standard as they occur, and keep them out of work-in-process, carrying them directly to the several variance accounts.

Handling of Scrap

Scrap is likely to cause a good deal of trouble if it is not properly handled. As I have already mentioned, the standard cost calls for a reasonable allowance for spoilage in the various manufacturing operations. This results in a standard quantity of scrap which is figured at a standard scrap value, usually the current sale price less the cost of handling and selling the scrap. The production records show the standard quantities for each operation or group of operations where a count and inspection can be made. The differences between good pieces or other quantities made and those called for by the standard will be accumulated daily and summarized, giving the basis at the end of the accounting period for entries which will credit Work-in-Process, debit Scrap at standard scrap value, and carry the difference to Gain or Loss on Material in Process.

In some businesses it is possible to salvage work-in-process that is not perfect by certain amounts of repair work. When the inspection, final or in process, shows pieces that can be salvaged they will be kept separate and then or later, put through the necessary processes and the labor required will be recorded on a special material or parts repair order. As the total pieces originally thrown out as not perfect would have been charged against the variance account Loss on Material in Process, the further labor and burden for repair work would also be charged to this account, which would finally be credited with the total standard cost of pieces finished as perfect. Necessary repairs to manufacturing orders can be kept separate by original orders, but in the average plant such detail is rarely worth while,

and it is more practical to accumulate a sufficient quantity of materials requiring repair work. If it is desired to know the extent of such work and whether it is or is not worth while, the records covering repair work can readily be analyzed.

We have reviewed in general the progress of our raw materials through the manufacturing operations to finished stock. Under our standard cost plan the finished goods, whether parts or completed machines, will be in the inventory at standard cost. If parts require later assembly into machines the same accounting plan will be followed as for progress of raw material to work-in-process.

The finished stock should be controlled by stores records similar to those outlined for raw materials.

Handling of Finished Stock

The handling of finished stock is becoming an increasingly important problem in many industries, due to the fact that customers are ordering in smaller quantities and forcing the manufacturer to carry larger stock and assure prompt delivery if he expects to get the business under present competitive conditions. Many concerns have made substantial savings in labor and burden costs for assembling, and particularly in keeping down the capital tied up in finished goods inventories, by carrying in stock very few completed machines, but making up a great many separate assemblies just short of the point where the individual requirements of the customer will affect the final product. For example, one customer will want a drive on the left, another one on the right, one will want a motor and another a belt drive, one will want certain attachments, and one will want others.

Under these conditions, it has been found best not to make the final assembly but to have the parts in such condition that the machine can be put together and shipment made very promptly after the order is received and we know exactly what the customer requires. Prior to the making of such studies of finished stock and partial assemblies it is often necessary, in order to fill a particular order, to take a finished machine and partially break it down, re-assembling with the changes called for by the customer's order, thus duplicating a substantial amount of assembly work.

Direct Labor

We next come to the second main cost element of labor, by which I mean direct labor. There are two kinds of variations of actual labor cost from the standard cost. First, more or less time taken for an operation than called for by the standard, and second, a greater or less rate per hour. If the direct labor operations are paid by straight piece work, the cost accounting is simple. It is necessary to see that the system of production records and the inspection is good, so that the company is paying only for good pieces made. If the current check is satisfactory, the standard labor cost will be the actual piece work cost. Any pieces spoiled in the manufacturing operations have already been covered in consideration of the loss on material in process, in so far as the material cost of the pieces in concerned. Presumably, the piece work price for the last operation is paid only for good pieces made. We must, however, consider the piece work labor paid for earlier operations on pieces that have just now been spoiled in the

later operation. It is necessary to accumulate from the production records the difference between pieces actually spoiled and the spoilage called for by the standard, and extend these differences at standard direct labor cost for prior operations in order to clear such labor from work-in-process, as of course, this work-in-process has been lost. The credit to work-in-process will be off-set by a debit to an account called "Loss on Labor," which is another variance from standard costs.

Occasionally, when breaking in the new workers, or under unusual factory conditions, operations which are normally on piece work are paid for at day rate. In such cases, the production made on these operations must be figured at the regular piece work rates and the difference between the total labor calculated at piece work prices and the total at day work becomes a loss on labor.

Measured in Time or Money

If the direct labor operation is paid for at other than piece work, we must show on the labor ticket the standard allowance for the operation, expressed in terms of time or money. It is usually an advantage to show this in time, as the difference between standard time and actual time is a real measure of labor efficiency and is not obscured by any differences in pay per hour. If a time allowance is used, it is also well to classify the men in various groups and use an average hourly rate for each group, picking up the total difference between the average and actual rates from the payroll. If this is done, the variances taken from the labor tickets will measure the extent to which the work on the various operations has taken greater or less time that the standard allowances.

If, instead of showing the standard as a time allowance, it is shown as a money cost, the ticket will also be extended at the actual cost based on the time and the man's pay, and the difference in dollars and cents between the standard and the actual will be accumulated and carried, at the end of the period, to the account "Loss on Labor".

Burden

The third and last main element of cost is what we term Burden. In developing a proper cost system this is usually the most difficult element of cost to control with substantial accuracy. Burden should be developed so as to put each department and manufacturing operation in an independent position, as if it were a separate business. Each department should be charged with the rent for the floor space occupied, with rent for the equipment used, with power, steam, indirect labor, supplies, repairs and all expenses necessary to handle current work, other than direct material and direct labor. The total burden for each department, properly determined to include all items, should then be divided by some measure of the work done, such as machine hours, man hours, pounds or pieces processed, or some such satisfactory unit, to give proper rates for determining costs of work done in that department.

Burden for each department or operation is charged to work-in-process as the work is done, the entry being made up from the summary of the labor tickets, where the burden is charged in relation to direct labor hours or money value, or from production or other records which will give the proper measure of the work done.

TIE-IN OF FACTORY RECORDS WITH THE COSTING SYSTEM

It is often convenient, in working out the detailed operations of a cost system, to combine direct labor and burden for some operations and use one rate in determining costs. Such shortcuts are often very helpful and, if properly applied, do not change the sound principles on which costs should be developed.

Standards for Burden

The standards for burden will be determined in the same way as standards for raw materials and direct labor. There should be accounting records by which all items of burden for a department will be grouped to accumulate the total, which will be compared with the credit for work done by that department at the standard burden rate, resulting in a final total gain or loss. This final gain or loss is in reality made up of two kinds of items. The first group we call "burden variances". These represent the difference between the standards set up for such variable operating expenses as supplies, repairs, or indirect labor, and the actual expenses for such items for the department for the period. The second group we call "unearned burden". This represents the difference between the operation of the department at normal capacity and its actual operation for the particular period. The second group of items show the loss from the various departments running at less than a fair normal capacity. It is particularly important to keep such losses out of the current costs, as it may well be that the work actually done in a period has been performed efficiently and at a reasonable cost, but the final result for the business as a whole will be unsatisfactory, due to lack of orders or other similar circumstances over which the factory has no control.

One of the principal advantages of setting standards and showing variances is to place credit or blame where it really belongs. Under a plan of standard costs you have a fair measure of the activities for each employee of the business, whether laborer, foreman, or executive. There is a predetermined goal to work for, and the records show how far the actual results differ from the goal as set. Standard costs properly developed also result in considerable savings of clerical work, and, what is more important, the saving of the time fo the executives in studying records by which they can judge the progress of the business and give proper control. Having set reasonable standards, the executives need put their attention only on variances from these standards. Wherever matters are going as expected and as called for by the standards, no executive attention is required, but where something is wrong, the variance quickly calls attention to the fact. With standard costs the information is current and not merely history.

Under present competitive conditions it is obviously important for the executives to know and know promptly what is going on. The man who knows, and knows he knows, is the man that wins.

Prize Awarded to Montreal Chapter Secretary

The directors of the Society, at a meeting in Montreal on April 10, awarded the $25 prize for the Chapter Secretary best reporting Chapter activities during the past year, to D. R. Patton, C.A., Secretary of Montreal Chapter. The presentation was made by Col. Thompson at the Chapter dinner the same evening.

Announcement will be made shortly of prizes for distribution this year.

Scrap—Causes and Effects

By G. A. PHARE,
Rapid Grip, Ltd., Toronto

(Before Toronto Chapter, November 13, 1929)

SAINT PAUL, we are told, was a tentmaker—an avocation which possibly accounts for his uniting of the three virtues of faith, hope and charity. Amateur campers will recognize the connection—faith in the dealer who said the tent could be put up in ten minutes, hope that it will stay up until daylight, and charity—for which we are a fit subject after having tried to sleep therein all night.

Whether the Apostle was a tentmaker or not, we know he was no accountant. In one of his writings he says, "I count not the cost," and in another passage he states "I count all as gain." A cost man can only get by with this sort of thing until the Chartered Accountants make their annual audit. After that he goes back to tentmaking.

Had he been a cost accountant, he might well have paraphrased the famous faith, hope and charity saying into "Now abideth scrap, spoilage and waste—and the greatest of these is waste." Having thusly, and somewhat laboriously, cast a mantle of orthodoxy over my text, I proceed to my sermon.

Nearly all manufacturing processes are accompanied by waste and spoilage, and these two factors form a problem which is always an irritating, and often a complex, element of cost.

Waste or Spoilage?

The dividing line between waste and spoilage is not always easy to define. Spoilage is always accidental, even though in certain lines of work a certain amount of spoilage is inseparable from the process, and must be counted on. The pouring of castings is a good example of this, where in spite of every precaution which experience and skill can suggest, air bubbles will appear and imperfect castings result. Waste, on the other hand, is incidental rather than accidental. It arises out of the operations of manufacture itself, and though it can be counted on, is not a fixed factor. In die-cutting a flat blank from sheet metal, for example, there will always be produced a certain number of useable blanks and so much waste—the quantities depending on the skill of the operator, the condition of the die, and the quality of the raw stock. Waste may also occur through chemical process—by shrinkage of material, loss by evaporation and the ejection of residues or scum, at various stages of the work.

Waste, then, is the unavoidable accompaniment of a manufacturing process. We cannot take as charitable a view of spoilage. Spoilage means imperfect work. Waste involves a loss of material. Spoilage nearly always means a loss of material and labor as well. In a batch of one hundred articles, ninety-six may pass inspection while four have fallen short of standard. The actual cause of the imperfection may be imperfect material, but if the spoilage occurs during process, then plainly the time spent on the production of the spoiled pieces is also lost.

Both waste and spoilage are definite elements of cost. It is the problem of the cost man to recognize them, to account for them, and to devise means for reducing them.

In a modern system there is no particular difficulty in recognizing where these two factors occur. Their reduction is an individual problem in each varying industry, requiring to be individually solved. But in their accounting there are two main methods.

Either the entire cost of production is charged to the finished and useable product—with a credit for the recoverable value of the waste parts; or the spoiled parts may be replaced and the cost of such replacement charged to a Spoiled Work account. The first method is the easier and more usual, although the less accurate; for the larger the individual run, the less effect on total cost, and therefore the less likely is it that the spoilage included in cost will be noticed and investigated.

Scrap is Waste With a Market Value

And this brings us to the third element in our subject, that of scrap. Scrap might be defined as waste which has a market value; and in the utilization of scrap, and thereby turning a total liability into at least a partial asset, lie many of the romances of manufacture.

Sawdust, for example, when it is simply allowed to accumulate and rot, is waste. When used as fuel or further processed into millboard, it becomes scrap. Iron filings have a low scrap value, gold filings are nearly as valuable as the original metal. Waste has no market value. It represents a failure to produce standard efficiency. Scrap, on the other hand, has a market value which may be high or low in comparison with the cost of its parent material.

Three Elements of Cost

It will be seen, then, that scrap, spoilage and waste are three separate elements of cost:

Waste is a loss of *quantity* of product, due to faulty handling of material, or to manufacturing hazards.

Spoilage is a destruction of material already in process, and carries with it not only the value of the material spoiled, but also the accrued labor and expense at the time of its rejection.

Scrap is marketable material of no use for the purpose to which the original material was put. It may frequently become the raw material for some by product, in which case a higher price can be obtained for it than would be possible otherwise.

Now, while the dividing line between these factors may often be a fine one, their respective treatments from an accounting point of view are by no means identical.

Having postulated that waste is inevitable, or at least highly probable, then it follows that the chief preoccupation of the accountant will be to observe whether it is greater or less, in any given process or series of operations, then experience suggests is reasonable.

Two Ways of Dealing With Waste

This, in turn, opens up two distinct lines of thought as to dealing with increased waste. If our manufacturing standards include a care-

fully computed figure for normal waste, then the excess over such standard must be due to preventable or abnormal causes. We may decide to leave this excess waste in our regular items of cost, either appending an explanatory footnote, or merely saying nothing until the inevitable time of reckoning, or we may prefer to eliminate this increased element of cost from the manufacturing account and charge it directly into a waste account, leaving the cost of manufacture identical with standard cost—identical, that is, in so far as the element of waste affects it.

The value of this latter method is that the cost of preventable loss is ascertained separately, and forms a valuable guide as to the efficiency of the technical departments.

But it will very justly be argued that the time to ascertain preventable loss is a much earlier one than the time of costing—that factory counts, inspection, or analysis should detect these before they ever reach a cost department. The answer is that much preventable loss is so detected, but that a great deal of loss is beyond the scope of the average workman, requiring more expert and detailed analysis which may result in changing of process, revised standards of purchasing, and the like. And nothing is more likely to cause such investigation than an unusual item of cost. Both the human inspection and the oft inhuman cost analysis have their places.

Where a Waste Account is carried—under any one of half a dozen names—it is customary to credit it with the net value of its own scrap. By the phrase "its own scrap" we mean "excess scrap." The question of normal scrap presents little difficulty, it being a direct credit to manufacturing, generally as a reduced cost of raw material. Scrap credited to Waste Account is excess scrap, corresponding to excess, or abnormal waste.

Accounting for Spoiled Work

The accounting for Spoiled Work is more complicated, and only the most general lines can be laid down as to its treatment, each industry having its own individual problem. We return, however, to our earlier axiom, that the prime necessity is to make an effort to ascertain the actual excess cost caused by the spoilage in process, no matter at what stage the destruction occurs.

Two methods are suggested. The first is a Salvage Department, to which spoiled work is charged, and with which it is credited after rehabilitation. This would be quite a satisfactory method if it were possible to return the salvaged article to the normal course of manufacture at the point where it was diverted. This is, however, not possible, if only for the fact that some work may be spoiled beyond the feasibility of repair. It also presupposes that the factory will be in the same condition as when the rejected part was taken away. But a series of machines may be working on shoes to-day and ships to-morrow and sealing wax the day after, and cannot be interrupted to complete the cabbages and kings of last week without running the risk of having more than the sea become "boiling hot".

The Salvage Department has its uses. In some industries it is the only practicable method, and later in the evening you will hear something of its operation and results in actual practice.

The alternative method is the replacement order, in which a new piece is ordered to be made up to the point which the spoiled piece had reached—and the point so indicated on the work sheet. The cost accrued on this replacement order is the actual cost caused by spoilage. This system is of more value in the business which manufactures to individual order, while the Salvage Department is more particularly applicable to manufacture for stock.

A Summary

Summing up the problems presented by waste, spoilage and scrap, it may be suggested that:

Waste is something that disappears, or fails to appear. Usually what remains is taken as the basis of cost, and the waste ignored except in its effect of increasing the cost of the actually sound parts.

Spoilage is something that is destroyed after having been worked on, and involves loss of labor and expense as well as material. It is handled through some form of Spoiled Work account, or again, the cost of the surviving products increased by the amount of the accrued loss.

Scrap is a by-product from process, both sound product and imperfect. Its net value is credited back to the source from which it actually comes, if this can be ascertained. If it cannot be ascertained, it is credited to Profit and Loss.

THE TREND OF PRODUCTION COSTS

COMMODITY prices moved just slightly lower in April, the Dominion Bureau of Statistics index number, compiled from 502 commodities, declining from 91.9 for March to 91.7 for April. The main groups compare as follows:

	April 1929	March 1930	April 1930
Foods, Beverages and Tobacco	97.5	100.3	100.1
Other Consumers' Goods	91.0	89.0	87.8
All Consumers' Goods	93.6	93.5	92.7
Producers' Equipment	94.0	96.2	96.2
Producers' Materials	95.1	89.0	88.2
Building and Construction Materials	100.2	96.0	94.8
Manufacturers' Materials	94.0	87.4	86.7
All Producers' Goods	95.0	89.7	89.0
All Commodities	94.5	91.9	91.7

These figures are percentages of price levels of 1926. Reductions recorded since that year are the greatest in manufacturers' materials.

In April the most important decreases were in the following: Sugar, eggs, cotton fabrics, silk fabrics, wool blankets and cloth, brass, copper, etc., and lead and its products. The most important advances were in vegetables, furs and raw cotton.

Demand for workers is still slack. While wage rates are being maintained, there is no difficulty in securing skilled help in nearly all trades.

Money conditions continue easy, and interest rates are moving slightly downward.

COST AND MANAGEMENT

Recording on Piece-Work Basis

By C. WARNES,
Canadian Kodak Company, Ltd., Toronto

(Before Toronto Chapter, November 27, 1929)

THE portion of the subject allotted to me is "Recording Sub-assemblies and Finished Goods on Piece Work Basis." I will also explain methods of recording finished goods when the inspection department record is used, and why it is desirable to take the inspection record rather than any other.

Many of you having visited our plant, have observed for yourselves a few of the operations I make mention of in my paper. Sensitized products, such as film, plates and photographic paper comprise our process costs. Cameras, photographic mounts, albums, paper boxes, printing and powders and solutions are taken care of by a job cost controlled and carried through by a special series of job numbers. Of the various kinds of film we manufacture, there is cine nitrate (professional motion picture film, such as you see projected on the screen every day); duplex and autographic roll film such as is used in the ordinary amateur cameras; portrait film as used in the professional studios; also commercial and dental X-ray films.

Use 13 Period Calendar

All our factory accounting has been carried on in accordance with the 13 period calendar since January 1, 1928, the system being very helpful in payroll distribution, comparison of factory costs, expense and production reports.

Labor is controlled by the Bedaux system, a universal unit of measurement used to check up the effectiveness of individual operators, departments and plants.

The Bedaux standard is guaranteed so long as the procedure of operation remains the same. The base rate is not so guaranteed but reflects the state of the labor market. However, one of our largest departments has been on Bedaux for the last five years without the slightest change in either standards or base rates.

Every day a posting sheet is placed in each department showing the results of each operator by day for a week, showing hours worked, total B's for day, average B hour for day, and premium earned. The departmental superintendent receives an analysis sheet giving a detailed departmental daily performance.

I will endeavour in as few words as possible to give a brief outline of the tie-in between our labor and production records as exemplified in our duplex and autographic roll film cost.

Processes Covered

The processes leading up to the finished product of roll film are as follows: Making silver nitrate; making film emulsion (which is a light sensitized product); pelloid coating (or putting a gelatine coating upon the celluloid preparatory to emulsion coating); emulsion coating; slitting and examining; spooling; boxing, wrapping and labelling.

Production is scheduled six periods ahead, revised or adjusted every period. Knowing our production so far ahead we are able to largely avoid peaks of production.

The celluloid is in rolls about half a mile long by one yard wide. The rolls are pelloid coated then emulsion coated and transferred to the slitting and examining department. These four operations are paid for on a footage basis (from the cyclometer reading of the machine, with certain allowances for roll changes, washing up, etc.). This information is also used for production records, each roll coated bearing a special emulsion number which is carried through to the finished product. The slit film in various widths is then transferred in small cans to the spooling department. At this point a routing ticket is started on its way for purposes of payroll, production, and history of the individual rolls of film. The duplex routing ticket is yellow with square corners. The autographic routing ticket is white with corners taken off. While the color is not discernable in the dark rooms yet it is very valuable for sorting in compiling production records. The cut corners are a good check in the dark room.

The spooler with the aid of a semi-automatic lathe puts the paper, sticker and film on the spool. The film must be started and cut accurately to take care of the required number of exposures. The operator afterwards puts on an outside dating band. The rolls of spooled film are placed in trays containing 200, 300 or 400 spools according to size. The routing ticket is placed in each completed tray with blank side out, to show the tray has not been inspected. The work of the spooling department is kept up to a high standard of quality, by enforcing a very rigid inspection system and classification of operators.

It is the inspector's duty to make a random inspection of every tray of spooled film produced in the department. She picks up at least six spools at random from the tray, unwinds them and inspects them for defective materials or faulty workmanship. She rewinds the spools, punches the outside end of the paper to show that the spools were inspected, replaces the spools in the tray from which they were taken and initials the routing ticket, places the ticket back in the tray, face side out, as a sign to the trucker the work has been inspected.

Inspection

If the inspector detects any faults in the spools, she shows them to the operator and foreman immediately. Should any fault be due to neglect or carelessness on the part of the operator, he immediately classifies the operator as follows:

Class A. A. E.—If an operator in good standing is found to be producing defective work, she is put into class A. A. E. for a period of 3 days. All her routing tickets are stamped A. A. E. If no more defects are found up to this time, she is again considered an operator in good standing. This work is given 100% inspection.

Class B. E.—If an operator produces defective work during the time she is in Class A. A. E., she is taken out of this class and put into Class B. E. for a period of one week. Routing tickets are stamped B. E. If no more defects are found she is advanced to Class A. A. E. for three days, then works her way forward to be considered an operator in good standing. This work is given 100% inspection.

Class C. E.—If an operator produces defective work during the time she is in Class B. E., she is put into Class C. E. for a period of one week. Routing tickets are stamped C. E. An operator who is

placed in Class C. E. is *penalized* by having her base rate reduced during the time she is in this class. In order to regain her good standing she must work her way back through the classes B. E. and A. A. E.

The work in all three classes is given 100% inspection. Should an operator after working her way back turn out faulty work, she is placed in Class C. E. immediately. Spoolers are paid only for good spools produced, defective spools have to be made up by the operator concerned. All class work is passed on to the examining department for further inspection. The examiners are also inspected, a random inspection being made here. The inspector collects all the defective spools that are rejected by the examiners. She takes them to the spooling department and procures new spools to replace them, placing them in their original trays. Each tray of examined spools is checked; the outside pasters in this department differ from those in the spooling department, it is by this paster the inspector can tell the spool has been examined. The inspector initials the routing ticket to indicate she has checked the tray. The stub from the ticket is then passed on to the departmental office and used for purposes of pay roll and production:

Sorted for Payroll	For Production—
Under Operator's Number—	Size
Size of Film	Kind
Kind	

The Bedaux cards containing each spooler's production and the standard applicable to the size are made up from these stubs and sent to the payroll department. The payroll check the correctness of the standards and multiply that standard by the production of the operator. The daily pay of the operator is figured from this source and is entered on the daily posting sheet, which is sent over to the manufacturing department.

The Bedaux cards are then sent up to the standards department, where a detailed record of the departmental daily performance is figured up on the analysis sheet, and sent over to the manufacturing department.

The film then passes from the examining department to the boxing department. Here boxing (wrapping in aluminum foil) and dating is done in one operation on an automatic machine, one machine turning out about 40,000 spools per day. Any shortages, which are practically negligible, are reported on the routing ticket. This machine is very delicate in its operation; should a carton pass along without a spool in it, it is automatically thrown aside. The stub at this operation passes through the same procedure as in spooling.

The clerks in our departmental offices are in most cases girls who have had considerable experience as inspectors or first-class operators, and are well qualified to take care of production and Bedaux cards. Duplication of clerical work has been abolished; if work is checked in the factory office it is not repeated in the main office.

We find the inspector's count the most reliable. The inspector's count is taken and tied into both our payroll and production records.

At the end of the accounting period these figures are incorporated into the various process costs and when applied show but slight variation.

Labor Cost and Cost of Sales

By J. A. W. ROWE,
Canadian Kodak Company, Ltd., Toronto

(Before Toronto Chapter, November 27, 1929)

WITH reference to "The Tie-ing In of the Labor Cost of Production to the Cost of Sales," Mr. Warnes has described very accurately, and in detail, some of our labor problems and our method of handling them. Where there is any overlapping in our treatment of the two branches of the subject allotted to us we hope that you will be charitable. We have found it almost impossible to avoid a certain amount of reiteration. However, perhaps no real harm will be done.

My few remarks will be more from the angle of the accounting department. Here we are very much interested in the final tie-in of the different production costs with the sales figures. Just here I might say that we analize our sales under some 70 headings, and we carry along our cost of production figures and merchandise purchased so that they may be similarly analized.

You have heard what we are up against in our film department in regard to the labor problem. This is the department in which the recording of labor is most intricate. Our problems in regard to labor in the other departments are simpler but varied. We have straight time or hourly basis, straight piece work and Bedaux incentives. Also the methods of arriving at production figures in the several departments are quite different.

Starting with our silver nitrate department, where the bar silver is nitrated and made ready for use in our sensitive emulsions, the production is in so many ounces of nitrate of silver. The labor in this department is simply reported as so much direct labor, and so much indirect labor. This, entering into the total cost of producing so many ounces, is passed along to the emulsion department as they requisition for it. I may say here that a variation of any account in the cost of direct labor per ounce will cause our cost department to go buzzing around until some adequate explanation is offered.

Direct and Indirect Labor

In all our costs our direct labor is shown separately to our indirect labor, thereby assuring a much more valuable comparative cost than if shown together. We have our indirect labor classified under some 12 headings, such as "Cleaning," "Clerical Work," "Trucking and Supply," "Piling Stock," "Taking Stock," etc. Also where direct workers are waiting for work, or held up on account of breakdowns, and the rest period allowed to girls who are working under Bedaux system, this time is all accounted for in indirect labor under those classifications. We find that Bedaux has been very helpful to us in this regard, by enabling us to eliminate a lot of these items from direct labor, where they were formerly shown, and recording them as indirect, thereby giving us a more equable direct labor cost. These

indirect labor charges, appearing on our departmental expense classification sheets every four week period, naturally cause trouble if there is much variation.

In our emulsion department, the next department in the production line, we have much the same labor question as in the nitrate department. The labor enters into the cost of producing so many gallons of emulsion, our cost department showing us the cost of each gallon produced.

From the emulsion department the output is charged out as used to the coating departments, the paper, film or plate coating departments. Here we start to use the Bedaux incentives in our wage payments, mostly on the basis of saving of time in doing certain operations. I am not going into any details in regard to Bedaux. Mr. Warnes has gone into it with reference to the film department as much as his time would permit. The theory is the same in all departments, with some little variations to suit the class of work. The total production of our coating departments is arrived at in square feet and passed along at so much per square foot to the paper, film or plate packing departments.

Scrapped Material

Now, in any of these departments something may happen to cause the scrapping of material manufactured, and it would not be right to pass the cost along to the subsequent departments as it would reflect in their costs. When anything of such a nature happens, authority is obtained from the management to charge the loss, including labor, to an account we call "Condemned Goods." This account is carried along in our general ledger, with an analysis of what the different charges are for, and is charged off at the end of our closing period into our "Cost of Goods Sold" account, the charge being applied to the class of produce it affects. If a batch of paper emulsion, for instance, was spoiled, when we are closing our books in June or December, and after we had found the cost of paper manufactured, we are under necessity to pick up these charges applying to paper from "Condemned Goods" and add them to the "Cost of Paper Manufactured" order to arrive at the proper cost to apply against sales of paper on our "Cost of Goods Sold Schedule". In this way these charges come into our "Cost of Goods Sold" account through "Condemned Goods" account instead of through the different "Cost of Manufacture" accounts, and consequently do not affect comparative costs.

In our paper packing and plate packing departments our labor problem is much the same as outlined for the film department. Of course these departments being finished goods departments, it is not necessary, when material has to be scrapped, to worry about the next department in line. If any trouble here is not the fault of the department and we do not want it to reflect in the costs, we can charge it off to "Condemned Goods".

Job Costs

In our camera department we are using job costs. Time cards specifying the order number of the camera which the men are working

on, also the operation number. During the various stages of labor through which the camera passes, each operator charges his time to the same job number with an operation number also for Bedaux purposes. Any labor on material spoiled is either not paid for or simply increases the cost of the order. I might state that time cards coming over from the department offices to the pay roll department are checked in the pay roll with register cards from time clocks.

In our powder and solution department, mount department, printing and paper box departments, the labor is also charged in on job numbers; of course I am speaking of what we call direct labor. The indirect labor, although carried along separately in our cost department analysis ledgers, is included on our cost cards with burden. We have a pretty adequate check on this indirect labor from our departmental expense classification sheets.

In these departments where we are using job costs, we use a fixed burden percentage in charging out burden to each job number, basing it on our previous experience in each department. This is done to enable us to close out jobs as soon as completed. This burden percentage is applied on the basis of direct labor. The actual burden is carried along in cost of manufacture accounts until we are closing our books, the "over" or "under" being closed into "Cost of Goods Sold" account, and applied against the proper heading on the schedule supporting that account. We record our costs in these departments for comparative purposes on cost cards. These have classifications to suit each department, such as direct labor, material, sundries and burden. As we are mostly producing the same kind of goods in each of the departments, we simply record the cost of the latest job on the card for similar previous jobs, the card providing space for showing each division of the cost at so much per 100 or 1,000 or some other uniform basis as the case may call for. Any variation in regard to the labor in our job costs is thus very readily spotted, and can be looked into and checked up.

In the departments where we are not using job costs, we find it more convenient to carry our cost of manufacture account along, practically as "Work in Process" and close them into "Cost of Goods Sold" at the end of closing period. When this is done all that is left in any of our cost of manufacture accounts is the inventory and work in process, and we are ready to apply our cost of production to our sales, supplementing our profit and loss sheet with this valuable information.

I believe that I was supposed to touch on the question of standard costs in relation to our subject, but it would be an imposition for me to take up any of your time in discussing this phase of the subject. We do not use them in relation to the figuring of any of our costs, consequently are not as familiar with them as some of you gentlemen are. I know from past experience what a storm of discussion standard costs usually evokes.

Now, perhaps all this has been too general to be of much value to you, but I feel that, following the interesting detail that Mr. Warnes has given you, it may give you some idea as to where all the work which we do in the recording of our labor leads to.

Recording Production on Straight Piece-Work Basis

By M. J. ROE,
Sangamo Electric Company, Ltd., Toronto

(Before Toronto Chapter, November 27, 1929)

THE subject given me by Mr. Oaten is a very broad one and can be dealt with from many angles, which would take up considerably more time than I am allotted. Mr. Patton and Mr. Steel of our firm gave you very instructive talks last meeting, and it remains for me, if at all possible, to carry on. However, as my subject deals mostly with accuracy in recording inter-departmental deliveries and the like, and as we do not particularly pride ourselves in this respect, having often difficulty in arriving at correct accounts, it is very hard for me to do.

Now, I believe the four most important counting points in any manufacturing concern are those where we take actual checks, namely:

1. Upon withdrawals of materials from raw stores.
2. The operator's count on completing an operation.
3. The inspector's count upon delivery to inspection department, and
4. The storekeeper's count on delivery of parts to stores.

A Manufacturing Order

In order to convey to you intelligently just how these counts function in our system, I thought it the best plan to bring along an actual manufacturing order recently completed. To explain the detailed handling would be boring and hard to follow. Therefore, I will endeavour to give you a brief outline of our system which will serve the purpose.

To begin with—the order before you carries the usual references such as quantity, piece number, piece name, order number, etc. A copy is given each department that works on the particular order as well as to the cost department. We also show the operations to be worked on, with the individual departments and materials to be drawn.

On the back of the order the department timekeeper lists the date, operation name, quantity finished and time spent, classified as to operations. This date is taken from the operator's daily time sheets.

This work card (of which there may be several on an order due to partial deliveries) accompanies the parts from department to department, showing the operator's count. The yellow slip attached is the final inspector's count on delivery to stores, which is used as the basis for computing cost figures.

These are the usual material and parts requisition forms on which the foreman draws from stores.

Checking the Operator's Count

In order to check the operator's actual count against that which we pay for, we record the count direct from their daily time sheet to this form. This is held by the cost department and is checked against deliveries on individual operations when the order is completed, which may be anywhere from one week to six weeks after the pay period. Until recently discrepancies so discovered were quite a problem, as by the time the order was completed and turned in for costing, considerable time might have elapsed since completion of some of the first operations.

Several reasons were usually offered in explanation:

1. Wrong manufacturing order number shown by operator on daily time sheet, which could quite easily occur, if two orders for the same part happened to be going through at the same time.
2. Wrong operation number shown, carelessness or unfamiliarity on operator's part.
3. Wrong final delivery count, often due to finished parts being taken from process for urgent requirement and no proper entry made.

You all are doubtless familiar with these or very similar difficulties in your own plant. It seems to me that in any busy factory where large numbers of small pieces are being processed such snags will be encountered, no matter how carefully the system is planned.

Up-to-date Records Essential

We have effected a big improvement lately in our own plant, largely by holding the department foremen responsible, and by keeping routine cost and labour records up to date. Naturally it is much easier to correct an error that occurred yesterday or last week than one that happened two weeks or a month ago. We also find:

1. There are more errors on requisitions than on deliveries.
2. Material is more often taken from stores without requisitions than it is delivered without the correct papers.
3. Our perpetual inventories all carry re-order points. An error showing more drawn than actual brings the parts to the attention of the storekeeper by calling for the stock to be replenished. Whereas, if there is more actually drawn than shown on the stock book, stores may be depleted before any notice for re-ordering is received.
4. Stock records kept on the bins lead to inaccuracies in filling requisitions and consequent errors in the shop on manufacturing orders. We find that an operator will take the stores count even if incorrect rather than re-count. This sometimes happens on consecutive operations when parts are small and difficult to check.

Remedies:

1. Weekly inventory checks.
2. Checking monthly consumption purchasing records.
3. Balancing of operators' quantities by foremen with final inspection counts.

We hope to accomplish:

A. Shorten time of manufacturing order in shop and so obtain a quicker check up.

B. Operations of group piece-work to eliminate a good many records and counts.

C. Elimination of holding such assemblies in stores.

D. Reduce hand counting to a minimum.

Finally:

I believe that the more forms and records the more chance of errors unless one form can be made to check another, which duplicates expense. The fly in the ointment is inaccurate records and the fact that the cost of proving our records threatens to be a great deal more than the direct saving. Mechanical counters, mechanical handling and standard containers appear to offer the safest solution. To err is human, and all of our operators are very human.

Without accuracy the cost accountant's skill and labor is heavily discounted. The shop realize this, and are continually searching for ways to increase the accuracy of the figures turned over to us.

COST SHEET

Order No..... No. Delivered.....

U. A. No..... Name.....

Part No.	Part Name	No. For Order	Cost Per C.	Total Cost

Total Mtl.
Mtl. Per C.

Op. No.	Description	Cost Per C.	Total Cost

Raw Mtls.
Pro. Labor
Gen. Exp.
TOTAL

Totals
Gen. Exp. % Amt.
To Acct. Journalized.....

Mtl. Per C.
Labor Per C.
Exp. Per C.
Total Per C.

Entered
Record
Cards

U. A. No.....
Order No.....

FINISHED MATERIAL REQUISITION

Deliver Material to.....Dept. Authorized by.....Foreman

Amount Required	Material Required	Piece Number If non. mention it	Charge to Order No.	Amount Delivered

Date and Time Ordered | Date and Time Delivered | Filled by

If process material is required it must be specified, otherwise finished will be delivered.

RECORDING PRODUCTION—STRAIGHT PIECE-WORK BASIS

RAW MATERIALS REQUISITION FORM

From.....Dept. Date.....

STOREKEEPER—Please Deliver

SANGAMO ELECTRIC CO. OF CANADA, Limited

For Mfg. Order No..... .....

Foreman

MANUFACTURING ORDER

Date.....

AMOUNT	PIECE NO.	ORDER NO.

DEPT. NO.....

PART NAME

REMARKS

MATERIAL:

Work Card which accompanies Parts on Inter-departmental Deliveries.

Order No. Amt.

Operation	Name	Amt.	Rej.

(Reverse side of Work Card)

Date.....
Received.....
Repair.....
Reject.....
Passed.....
.....
Inspector

INSPECTOR'S DELIVERY SLIP

DEPARTMENT DELIVERY AND IDENTIFICATION TICKET

Deliver to ..... Order No.....
From ..... Lot No.....
Operation ..... Piece No.....
Description .....
Operator ..... No. Delivered.....
Disposition and Remarks .....
.....
Date Del..... Time..... Rec. by..... Date..... Time.....

Counts on materials and time spent recorded direct from operator's time sheet to this form. On completion of order these details are checked against those on back of manufacturing order form, and should agree:—

No. Ordered.....Part Name.....Order No.....

Op. No.....Op. No.....

Date	No. Good	Clock No.	No. Hrs.	Rate	Amount	Total	Date	No. Good	Clock No.	No. Hrs.	Rate	Amount	Total
Totals													

OPERATOR'S DAILY TIME SHEET

Date..... Department.....

Operator..... Clock No.....

Order No.	Oper. No.	Operation Name	No. Finished	No. Scrap'd	TIME A.M.	TIME P.M.	Total Hrs.	Rate D.W.	Rate P.W.	PRODUCTIVE D.W.	PRODUCTIVE P.W.	Non-Prod.
					Totals							

Entered Factory Order

Count Checked

Checked and Ent'd Pay Roll

Total Amount Received

Accounting for Materials

By R. OATEN,
Gurney Foundry Company, Ltd.

(Before Toronto Chapter, November 27, 1929)

I AM going to outline a simple method of charging materials and parts out of stores into production with the least amount of clerical work. Part of this plan is used in a plant I visited recently. Unless we see something better, we intend to adopt it to our own business next year.

Physical Conditions

The physical conditions which seem to be necessary before it could be carried out successfully are:

1. A stores department located on the same floor adjacent to the assembly department. This store-room should be completely enclosed with nothing less than chicken wire and be in charge of a store-keeper, so as to prevent anyone from getting materials out of stores contrary to the routine set up.

2. There should be sufficient space in the stores to house an adequate reservoir of materials and parts to guard against what is commonly known as "shortages" during at least one week's period of assembly, if all supplies were temporarily cut off.

3. There should also be sufficient free space in that stores department to give ample room for trucks to be loaded with the parts required on the assembly floor for a period of anywhere from one day to one week, depending upon the volume of business going through and the amount of staff which you can afford to handle a stores department of this kind.

4. These trucks should be made of convenient size to carry a specified number of complete sets of parts for the standard task of an assembler or a certain number of assembly line parts, depending upon whether the assembling is on the individual assembling plan or the group-line plan of assembly.

Accounting Plan

The statistical, accounting or cost information necessary would be as follows:

1. A material and parts specification sheet or cost details sheet which would be priced up at either average or standard cost, depending upon the system being operated in the plant. For example, we shall suppose you are dealing with a gas cabinet stove which consists of, say, 95 separate pieces. The parts and materials entering into that stove might be divided into three classes for our purpose as follows: (a) outside purchased parts on which we do no work at all; (b) parts processed through our factory departments and finished up to the point where they are ready for assembly, but which are not finished with vitreous enamel; (c) enamelled parts which we would put in a separate class, because our enamelling department is a

separate unit in our plant, and for several reasons we desire to keep the operation of that unit apart from our regular stove business.

2. Assuming that this parts specification, or details cost sheet, would show the total value of each of these, class a, b and c, materials and parts, we should know that for every stove of that particular type, finished on the assembling floor, we should absorb a certain definite dollars and cents value from each of these classes of stores.

3. It is impossible to run an assembly department without a certain percentage of spoilage, breakage and rejection of parts and materials no matter how careful the storekeepers are in examining the parts as they come through their hands. Any parts which are discarded for these reasons would be replaced to the assembling department on spoilage orders which would be filled from the stores department, priced at unit cost or standard, and recapped at the end of each week in the classes of materials a, b, c. To carry this through successfully there would have to be a strict rule maintained that the assembling department would get its parts from two sources only, first, from the truck loads of complete sets of parts required for the production programme as laid out from week to week; second, from spoilage orders as explained in this paragraph.

4. The production reports or records are on a weekly basis and show only the finished goods which pass final inspection ready for delivery to warehouse or to the shipping room.

The Plan in Operation

With a physical condition as outlined, and with detailed cost information as suggested in items (1) and (2), let us use the illustration already given in regard to a cabinet gas stove. Imagine that materials (a) on that stove at a standard value of $4.80, parts (b) $17.10, parts (c) $12.50. If total production that week in that particular type of stove amounted to 70 the entry would be built up:

70	x	$ 4.80	$ 336.00	(a)
70	x	17.10	1,197.00	(b)
70	x	12.50	875.00	(c)

Finished production would be debited with $2,408.00, stores (a) credited with $336.00, stores (b) credited with $1,197.00, stores (c) credited with $875.00.

The time is too short for me to go into much detail in throwing out this suggestion. I think anyone present can easily see how it would be possible from the finished production report of each week to charge the main bulk of materials and parts absorbed from stores in a simple weekly entry, instead of having to bookkeep each little part, or each set of parts, as they pass out of stores. Then, by taking the summary or recap of these spoilage orders, a weekly entry could be put through dealing with spoilage. This would be related to the dollars and cents value of parts absorbed in finished production so as to get the relation between spoilage and standard for purposes of controlling that spoilage and reducing it from week to week. It is left to the preference of the company as to whether all spoilage should be charged to spoilage account or only that portion which is in excess of an accepted percentage of spoilage.

Apart altogether from the saving in clerical time, you will readily understand how this plan of segregating stores for a day's production, or a week's production, in truck loads, in sets will make the assembling run much more smoothly.

It will leave the foreman of that department free to find less costly ways of doing his job, instead of taking up his time in "chasing parts," a condition which seems to be very prevalent in all plants where they rely upon the plan of sending a material man or a trucker to the stores department to get materials required by individual mounters in varying quantities without definite regard to what is actually required for any particular period of production.

While I have related this illustration to dollars and cents entries, or a value of materials and parts charged into production, the same plan can be used in dealing with materials and parts on a poundage or unit basis.

COST LITERATURE

RECEIVED IN MAY

DEVELOPMENT of the Art and Science and Philosophy of Management Since Taylor. H. P. Kendall. Society of Industrial Engineers, April, 1930.

Philosophy of Labor. J. O. Hopwood. Society of Industrial Engineers, April, 1930.

Coke Oven and By-Products. W. Howard Davies, F.C.W.A. Cost Accountant, April, 1930.

What the Works Manager Requires From His Cost Accountant. F. H. Fleck, Cost Accountant, April, 1930.

How to Use Trend Percentages in Analyzing Progress of Business. S. Gilman. American Accountant, May, 1930.

Cost Accounting—Its Place and Influence in Modern Industry. C. R. Stevenson. The Accountant, April 26, 1930.

Newspaper Accounts. G. Sadler, B.A., A.C.A. The Accountant, May 3, 1930.

Budgetary Control. W. H. Nicholls, F.P.A. Accountants' Journal, March 20, 1930.

Some Notes on "The Art of Presentation". M. S. Spence, C.A., F.P.A. Accountants' Journal, March 20, 1930.

COST MEN AVAILABLE

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Drawing Materials from Stores

By F. E. BROOKS,
Canadian National Carbon Company, Ltd.

(Before Toronto Chapter, November 27, 1929)

THE subject of this paper is "Drawing Materials from Stores," with an explanation of the methods adopted for charging materials to production costs. The system I am about to explain relates particularly to the mass production of articles that are produced for stock rather than on specific sales orders.

I believe you will all agree with me that in the case of the manufacture of articles of a like kind, where the finished product varies only in size, and practically the same operations are carried out on all types, similar materials used varying only in size and quantity in the finished product, when these articles are being produced from day to day, it is practicable to dispense with the usual individual cost order method of collecting cost data on each run of production and in its place substitute a cost summary system resulting in the compilation of product costs for each calendar month's production.

Operating under a cost system of this description, it is unnecessary when drawing materials from stores to indicate the specific product or run of product for which the material is to be used. Similarly, labor costs can follow a like precedure and operation costs can be compiled rather than individual order costs.

For a number of years I have had experience with a system embodying the aforementioned principles, and I sincerely appreciate the opportunity that has been given me to-night to outline briefly to this gathering the methods followed in accounting for materials delivered to production under this plan.

Output and Stock Related to Sales

With a product that is more or less in constant demand, although varying in total demand throughout different periods of the year, and where the demand does not vary to any large extent from one year to another excepting by type, the production problems of a factory manufacturing such a product is pretty much confined to establishing a continuity of production in such volume as to maintain a minimum of finished stocks sufficient at all times to meet sales demand. The statement "minimum finished stocks sufficient at all times to meet sales demand" refers particularly to a product that is perishable or depreciates with age. On a product that does not depreciate by stocking, it is possibly more economical to maintain a continuous rate of production without regard to the amount of finished stocks carried.

When the sales demand is therefore a known quantity, and the sales department issues a periodical estimate of their requirements,

it is a simple matter to formulate a production programme which will have the desired effect of ensuring sufficient finished product.

Under this plan, weekly production schedules for each department are prepared with the aid of the sales department's estimate of requirements, each department's schedule showing the daily production desired by type of product. From the weekly departmental schedules a master requisition sheet of materials needed is prepared, basing material requirements on predetermined laboratory standards for materials where the actual usage per unit is more less unknown. This refers particularly to bulk materials from which the product is fabricated according to established formulas but due to several causes such as slight variations in gauge of materials, non-uniform efficiency of machines, etc., the actual usage will vary from time to time. On materials where the usage is a constant factor, definite quantities per unit of product can be used as the basis for material requirements.

I would like to mention at this point, that it is not the practice to deliver the exact quantity of materials necessary to produce the scheduled quantity of articles, consideration being given to the manner in which materials are received from vendors and, insofar as practicable, materials are scheduled for delivery in the original containers as received from vendors. By so doing, considerable rehandling of materials by the stores department is avoided and broken lots are reduced to a minimum. With the majority of materials in standard packages, the problems of inventory taking are also relatively small.

Master Requisition Sheets

When completed the master requisition sheets show the daily and weekly totals of all materials to be delivered, deliveries being so scheduled throughout the week as to ensure a sufficiency of materials for assembling, with due consideration being given to keeping stocks on the production floors at a minimum. Copies of the master requisition sheet are furnished to the stores department and manufacturing foreman.

These master requisition sheets do not serve as the authority to the storekeeper to deliver materials, but as a guide to him as to the quantities of materials he is expected to have on hand for delivery to cover the week's production.

The actual delivery of materials from stores is effected through the medium of stores issues originated by the planning department in accordance with deliveries as specified on the master requisition sheet, and forwarded to the stores department on the day prior to the one delivery is specified.

It is unnecessary, I believe, for me to dwell to any extent on the form of stores issues employed. I should like, however, to say a few words about one particular feature contained on the stores issues. Space has been provided on the form for the storekeeper to record the balance of materials in stock as shown by his bin card after the quantity called for on the issue has been deducted. This feature has been found to be of great value in effecting a continuous reconciliation between storekeeper's bin cards and balance of stores records.

Stores Accounting

When the materials are ready for delivery, the withdrawals are posted to the bin cards, and the materials are delivered to the production floors, where a receipt is obtained from the foreman. The stores issues are then passed to the department responsible for stores accounting. It is the responsibility of this department to keep an accurate record of receipts and disbursements of raw materials, supplies, sub-assemblies, and finished product, and to this end balance of stores sheets are employed on which to record all materials excepting supplies, and balance of stores cards used for recording supplies.

The balance of stores sheets used have been devised to show current and monthly quantity balances and monthly value balances. Thus information regarding the inventory of materials in stores is available at all times and the value of materials in stores is available at the conclusion of each month's business. These forms are intended to cover transactions for a period of four (4) months and for each month a separate summary of receipts and disbursements by quantity and value is computed. This particular form is utilized in order to average the cost of materials rather than to disburse each lot purchased at the actual unit cost as purchased. This practice materially helps to stabilize material unit costs through market price fluctuations and changes in cost due to varying quantities purchased.

May I digress from the immediate subject for a moment to outline briefly the system under which stores are classified. The mnemonic system of classification is employed, and all stores are divided into classes according to their use and kind and a symbol is given to each by which it may be identified. These symbols are so selected as to suggest in general the kind of stores and are arranged so that they do not conflict with the account symbols but harmonize with them and other elements. For example, raw materials are classified under the symbol SR, "S" denoting stores account, and "R" the significant symbol for raw materials. Raw materials are further sub-divided into a number of subsidiary classes, each class having a designating third letter added to the major symbol SR. This sub-division of materials into stores accounts and symbols is a material aid to inventory taking as it is possible to inventory the stores in any single classification and effect a reconciliation with the stores account balance in the Factory Control Ledger.

Invoices covering materials received, are symbolized according to the proper classification and are debited to the stores account in the factory ledger as indicated. All stores issues for materials delivered to production also bear the stores classification and the stores accounts credited with the monthly value of disbursements. This latter phase is carried out in the following manner:

Stores issues as received from the stores department are posted to the balance of stores ledgers, the quantity only of materials issued being posted. Where a material is common to more than one department, each department's withdrawals are recorded in separate columns.

Prices for Costing

When the last invoices for the month have been posted to the balance of stores ledgers the average unit prices at which the materials are to be costed to production are calculated by totalling re-

ceipts and balances first of the month. The next step provides for the totalling of the individual departments' withdrawals, which are then posted to the withdrawal section of the monthly summary and priced at the current month's average unit price.

Each department has a monthly material issued sheet on which all the materials used by the department are listed. The sheet provides for quantity and value columns for the current month's withdrawals, inventory first of the month, inventory last of the month, and net available for production. The "net available for production" being calculated by adding "withdrawals" for the current month and "inventory first of the month" together and deducting the "inventory last of the month." The inventory first and last of the month, of course, refers to materials on hand in the production departments. I would also like to mention that products in process of manufacture are also included in the first and last of the month inventory figures, the practice being to revert product in process back to its last sub-assembly or raw material stage.

When completed, the values on the monthly material issued summaries are added by stores classification and the classification values credited to the respective stores accounts and debited to the departmental process accounts in the factory ledger.

Inventory and Production Records

The first step in the procession of events leading to the cost finding of products is the taking of a physical inventory upon completion of operations on the last day of each month, of finished stores, sub-assembly stores, product in process of manufacture, and raw materials on the production floor, this phase being carried out by competent stores, office, and production employees.

The second stage involves the reconciling of inventories and production from the finished product backward to the first sub-assembly stage. This is effected in this manner:

In the finished stores, to the quantity in inventory last of the month, is added the shipments made during the month, and from the sum the inventory first of the month is deducted. The balance represents the theoretical production that should have cleared through the finishing department. Any difference between the production reported by the finishing department and the theoretical production as calulated under the aforementioned plan may be due to incorrect shipments, errors in reporting production, or pilferage.

In the case of incorrectly reported production, this can readily be traced by proceeding backward with the reconciliation through the various departments from the finishing to the primary, and corrections to production quantities made.

With the completion of the reconciliation, the third stage involves the prorating of the material values from the material issued summaries over the products in which they are used. The majority of raw materials and sub-assemblies used are common to a number of types of products, although some types require more of the same material per unit than other types. Thus the values of materials are prorated to the individual types produced in the ratio that the requirements of each type bears to the whole.

Total Material Cost

The values of all materials prorated against the individual types produced are then added, the result furnishing the total material cost on each type produced in a given department during a month. This operation is repeated for all departments from the primary to the finishing department, the material value of products increasing as they pass through the various sub-assembly stages.

It may be interesting to mention the principle followed in issuing materials from sub-assembly stores. Sub-assemblies never reach the stores department but remain under the control of foreman whose department processed them. Stores issues are not originated to withdraw sub-assemblies, neither are bin card records maintained. Control of sub-assemblies is obtained from the monthly physical inventories, the quantities to be used in production being arrived at through the production reconciliations.

Excess or Rejected Materials

When this subject was assigned to me, I was also requested to explain the manner in which materials drawn in excess of the amount actually needed in the production of articles going through is dealt with, and how materials rejected after being withdrawn from stores are handled.

Referring to the first of these subjects, dealing with materials drawn in excess of the quantity actually needed in the production of articles going through, I would like to take you back to the method of prorating materials which I have previously referred to. In this calculation the respective figures of theoretical requirements and actual usages are displayed in adjacent columns on the cost summaries. Thus any discrepancies between the two figures are apparent to the cost clerk who is responsible for carrying out an investigation where the differences are such as to deem it necessary, and usually it is possible to bring the figures into close reconciliation. These small overusages or underusages of materials are prorated over the articles produced in the same ratio as the requirements for each type bears to the whole.

In connection with the second subject relating to the manner in which materials that are rejected after being withdrawn from stores are handled, I have this to say:

Raw materials as received before being accepted in stores are subject to a very rigid inspection, embodying all the phases of examination laid down in standard raw material specifications. Consequently the amount of raw materials rejected in the production department is negligible. However, when such rejections do occur that are directly attributable to the vendor, the material is credited to production and returned to stores to await disposition from the vendor.

In the event the production department is at fault, the value of the material rejected is credited to production and charged to one of a series of salvage or scrap orders, the residue on the orders being charged monthly to the reclamation of errors overhead account of the department responsible for the rejection. The same practice is followed in the case of the rejection of products in process of manufacture; the accumulated value of the product up to the point of rejection being credited to production and charged to salvage or scrap orders.